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Late Mesolithic notched blades : tools for plant working ?

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Abstract. During the 7th millennium BC, important changes occur in Western Europe. The lithic production focuses on regular blades, knapped by pressure or indirect percussion. These blades are often retouched with one or several notches, sometimes giving them a serrated appearance. We have studied a sample of notched blades coming from different late Mesolithic sites (7th and 6th millennium BC) in France and Belgium. The wear analysis of these tools shows that the notches are the result of a voluntary retouch and are used as scraping tools. The variability of the observed wear traces suggests that different materials have been scraped, among them different vegetal materials. This preliminary study presents our first results, some functional hypotheses and a discussion about the place of the notched blades in the lithic toolkit.

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1/ What is the problem ?

During the 7th millennium BC, important changes occur in lithic technology on Western Europe allowing to distinguish two main parts : early and late Mesolithic. For the moment, it seems that the economic and social bases of these peoples of hunters-gatherers do not know major revolution, the archaeological proofs of animal or vegetable domestication are very evanescent and subject to change on these areas.

The new lithic standard focuses on regular blades knapped by pressure or indirect percussion with new methods (Perrin *et al.*, 2009 ; Binder and Collina, in press). Some of these blades are then transformed to realize two tool types which are widespread in the whole area considered, except in the British isles, but also in North Africa : trapezoidal geometrics and laterally notched blades (lames Montbani) . The latter can have one or several notches that sometimes

give them a serrated appearance (figure 1, 6, 7, 8). Archaeologists describe a « package » characterised by the association of these two emblematic tools, which are often drawn together in publications.

Rozoy thought that there was no definite intentional shaping (Rozoy, 1978, 1970), and suggested that the retouch was a use retouch created during a wood peeling process (figure 2), so that the tools change in shape from blank blades, to laterally irregular retouched blades, and finally notched blades (Rozoy 1978, 1969). On the contrary, one of us sets notched blades apart from laterally retouched blades and from used blades (Marchand, 1999), but with some uncertainty, expecting use wear analysis to definitely classify notched blades. Some other scholars, according with the hypothesis of use removal, do not distinguish notched blades from other irregular removals (Binder, 1987).

So our technological and functional research tries to answer different questions:

- Are notched blades retouched tools or use scars?
- What are the specific functions of these notches? What are the active parts of these tools, how were they used, on what material, for what aim? Do they have different functions?
- What are the links between these tools and the other parts of the technical system?

2/ Use wear analysis of late Mesolithic notched blades

In order to answer these questions we have selected some notched blades from 10 late Mesolithic sites showing very different topographical situation and located over a large area in France and Belgium (figure 3, 4). The use wear analysis has been performed by four different use wear analysts (CG, BG, EC, SP). More than 100 tools have been studied, among which 43 blades gave the results of this preliminary study (figure 4).

The notches are always made by direct removals. But there is a great diversity between the notched blades: some of them have only one notch, whereas others have several; the deepness of the notches also varies greatly from one tool to another.

All the used tools were used as scraping tools. When it is possible to determine it, the non contact surface is always the retouched dorsal face, and the leading aspect or contact surface is always the ventral surface. The majority of the notches have been used with a rather high angle of the non-contact surface, near 90 °. So these tools were used in a scraping motion, what we call “coupe négative” (figure 5). According with the use wear variability, different materials have been worked.

The majority of the tools (26 blades) bear poorly developed use wear. They show one or more scraping use zones, with a total of 42 used zones. When the used material can be recognized, it is either wood or plants. The active part of the tool is always the inner concave part of the notches, never the spur between two notches. Edge damage is very limited or absent. Polish on ventral face is limited to a band along the edge, creating a domed bevel, with some striae. On the retouched dorsal face, the polish is not very developed (figure 6). These notches have been used to scrape wood or rigid plants; the ventral face is always the contact surface, generally with a high working angle. A few blades only were used with a low working angle.

The wear on 12 used notches is not enough developed to allow some interpretation more definite than “scraping rigid material”. Some blades from Oudenaarde, Aven Akers and l’Essart were used on abrasive material (17 used zones). Four blades have a very developed use wear. A notched blade from Beg-an-Dorchenn has a dorsal face with a bright smooth polish, and a ventral face with an invasive pitted and striated polish (figure 7). The ventral face is the leading aspect of the tool, used at a low angle to the material ; the dorsal face is the non contact part of the tool used with a circa 90° angle at the very beginning of the dorsal surface, according to the convex morphology of the initiation of the retouch scar, as can be seen on the imprint that has been made in synthetic resin. This is consistent with the working of some soft plant material. The two different polishes are similar to thoses described in some Neolithic and Mesolithic contexts (Juel Jensen, 1993; Allard *and al.*, 2004).

One blade from l’Essart and one from La Grange (figure 8) have a similar smooth polish on the dorsal face, and on the ventral face, a domed polish, with few striae, without the pitted and rough appearance of the previous one. That could also indicate that it has been used to work soft plant material, probably different from the previous one, but with the same working position. This particular use pattern is very similar to the one described in Neolithic industries, for instance on burins in Chassey culture in Southern France. One blade from La Grange is used to scrape a siliceous vegetal, with a highly reflective polish on both faces and oblique striae on ventral face, without any retouched notch, but its stratigraphic position is unsure and it is maybe an older tool from middle Mesolithic levels.

Four blades from Noyen and Dammartin-Marpaing were maybe used to scrape bone, according to the polish (figure 9). However, we have noticed that these tools presented almost no use scars at all, contrarily to our experimental tools. On the other hand, some tools from l’Essart present short scalar use-scars with step and hinge terminations, which also suggest that they were used for scraping some kind of hard material.

Another important result is that every notch appeared to be an independent use zone. For instance, on a blade from Choisy-au-Bac, a first notch was used, then a second notch was created and used. That is to say that the notches were not created in order to function together, but one by one, as the work was going on.

3/ Notched blades are actually retouched tools.

It is not easy to distinguish between retouch and edge damage. We can demonstrate that notches are not created by use damage.

The scars have often a convex, non conchoidal, initiation. These scars result probably from bending fractures (Hayden, 1979). They can be created by pushing the side of the blade on a wooden cylindrical piece. This could be a way of retouching the tools, but it could also result from edge-damage itself.

All scars are located on the dorsal face. If these scars were the result of scraping wood with the ventral face as the non-contact surface, as proposed by Rozoy (figure 2), one would then expect to observe a different distribution of the polish: in that case, the bevel would be on the upper face, and the smooth to snow melting polish on the ventral face. We have never observed this pattern on the Mesolithic tools. The bevelled polish is always located on the ventral face (figure 6, 7, 8, 9). Therefore we can consider that these notches are not the result of a scraping process with the ventral face as the non-contact surface with a $\sim 80\text{-}90^\circ$ working angle.

Edge damage scars occur on the dorsal face on experimental tools used with a “coupe positive” movement, the dorsal face being the non-contact surface with a working angle higher than 90° . On these experimental tools (figure 10, left), edge-damage scars are not as deep as voluntary retouches and are often present on both faces. The polish is rather similar on both faces. This is very different from the use wear observed on Mesolithic tools.

Therefore these large scars resulting from bending fractures observed on the Mesolithic tools are probably created by retouch. These voluntary notches, creating a strong edge angle, are efficient tools for peeling and smoothing wooden stem. The distribution of the polish on the archaeological material is consistent with the polish distribution on experimental tools with retouched notches, used with the ventral face as contact surface (figure 10, right).

Conclusions

After this study on a large area, we can underline a few results:

- The notches are voluntarily made and do not result from use. The specific morphology of the retouch that sometimes presents no bulb negatives probably indicates voluntary bending fractures, which enables a striking angle close to 90° . This could confer a stronger capacity for tearing up the worked materials. Some notches had conchoidal scars, but there was no associated polish: the interpretation was difficult and they are not taken in consideration here. Therefore the notches probably result from different processes, but we need more evidences and we have to enlarge our sample.

- These tools are always used in a transversal motion and never in a sawing motion. The dorsal retouched face is always the non-contact surface, the ventral face the contact surface. They are probably used on different materials, probably for different tasks, but the main uses concern especially the vegetable world : shaping of arrowshafts ; basket-making (Mordant and Mordant, 1987); string or thread making (Hardy, 2007; Martial and al., 2005). Bone working is probably present.

Notches were perceived by all the archaeologists of the last century as essential in the definition of these tools of the late Mesolithic. Our study shows that there is a functional background behind this fact, through a same design, with a same way of using the tools, but with different tasks on different materials. There are however sites of the late Mesolithic where notched blades are lacking; so it would be necessary to check some points: are these functions realized on other tools like blank or irregular retouched flakes or blades, on those sites without notched blades as well as on sites where notched blades are frequent ? Is it an other cultural standards? Is there a functional specialization of the settlements? Once again, a larger sample will be necessary.

This research program needs more observations on industries from the 6th and 7th millennia cal BC. Such a study would also need comparison with material from neighbouring areas, as we have only analysed French and Belgian material for this work, and with older Mesolithic industries, where plant working tools are in some places frequent (Beugnier, 2007). Are notched blades new tools for previously existing functions, or new tools for new functions? More experimentation would also be useful in order to better document this particular tool. For this study we wanted to gather material from a large geographical area in order to determine the coherency of the phenomenon, but we must now enlarge our analysis.

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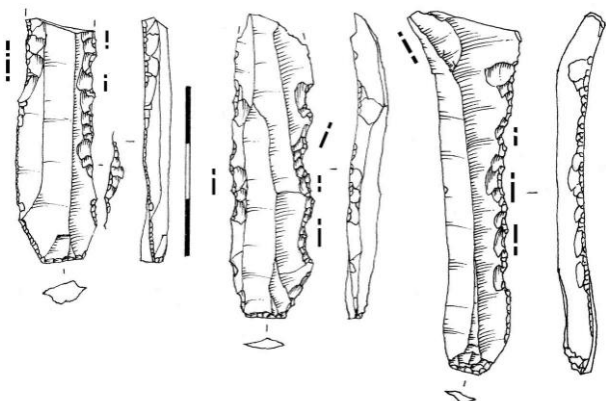


Figure 1: Notched blades from L'Essart with scraping use zones. Drawings F. Blanchet.

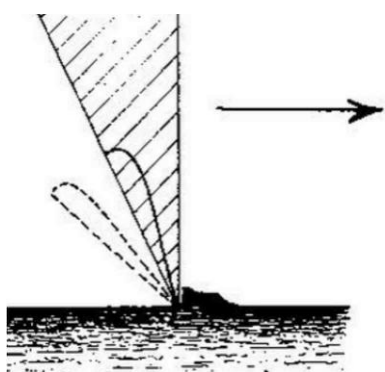


Figure 2: Functional hypothesis according to Rozoy (1979): notches created by use-removals.



Figure 3: Location of the sites.

Site and town	archeologist (use wear analyst)	Site nature	number of studied pieces (with use wear)	Scrape soft vegetal / wood	Scrape siliceous soft vegetal	Scrape siliceous vegetal with oblique striae	Scrape vegetal with rough polish on contact surface	Scrape bone	Scrape abrasive material	Scrape unknown material
				Number of used zones						
Beg-an-Dorchenn (Plomeur)	O. Kayser, C. Dupont et G. Marchand (B. Gassin)	shell midden	15 (1)				1			
L'Essart (Poitiers)	G. Marchand (B. Gassin, S. Philibert)	riverside	47 (12)	20	1				11	9
Moure de Sève (Sorgues)	D. Binder (B. Gassin)	shelter	20 (3)	3						
Grande Rivoire (Sassenage)	P.-Y. Nicod (B. Gassin)	shelter	5 (1)	1						
la Prairie du milieu (Dammartin-Marpain)	F. Seara (E. Claud)	riverside	4 (4)	1				4		
La Grange (Surgères)	L. Laporte / G. Marchand (B. Gassin)	riverside	9 (3)	1	2	1				3
Le Haut des Nachères (Noyen-sur-Seine)	C. Mordant (C. Gueret)	riverside	4 (4)	3				5	2	
La Bouche d'Oise (Choisy-au-bac)	B. Valentin (C. Gueret)	riverside	3 (3)	3						
Aven Ackers (Verrebroek)	P. Crombé and J. Sergeant (C. Gueret)	Dune	3 (3)	3					1	
Oudenaarde (Oudenaarde)	P. Van der Plaetsen, J. Vanmoerkerke, J. P. Parent (C. Gueret)	Dune	17 (9)	7					3	
total			127 (43)	42	3	1	1	9	17	12

Figure 4: Tools and their uses from the different sites.

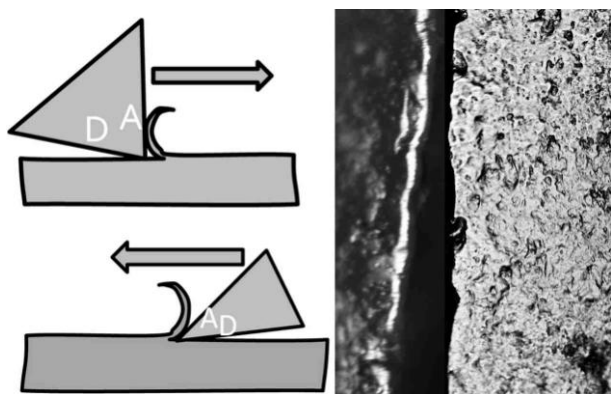


Figure 5: “Coupe negative” (up) and “coupe positive” (down) :

two different transversal movements. Photograph: scraping soft wood, “coupe negative”. Left: bevel on contact surface (ventral face) ; right: polish on non-contact surface (dorsal face).

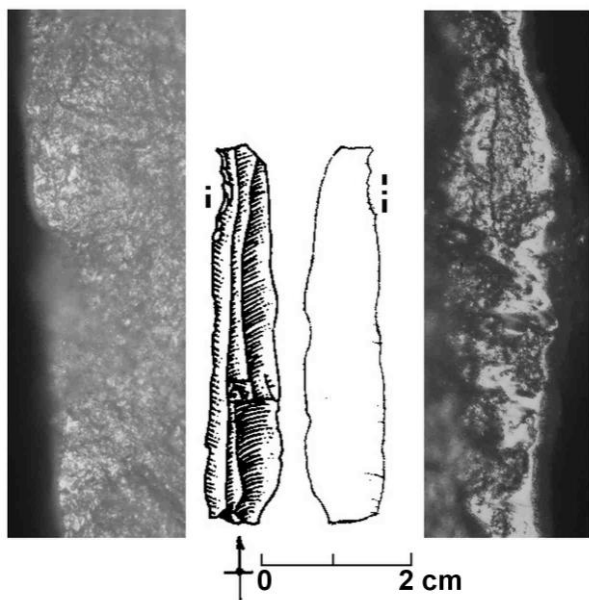


Figure 6: Notched blade from La Grande Rivoire.

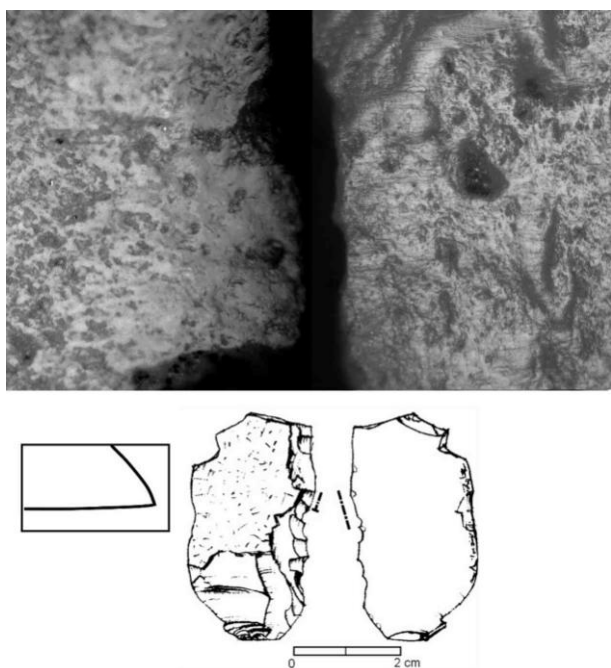


Figure 7: Notched blade from Beg-An-Dorchenn. Photographs : Non-contact surface on the dorsal face (left) with smooth polish, contact surface on ventral face (right) with a striated and pitted polish. Left down: section of the used zone.

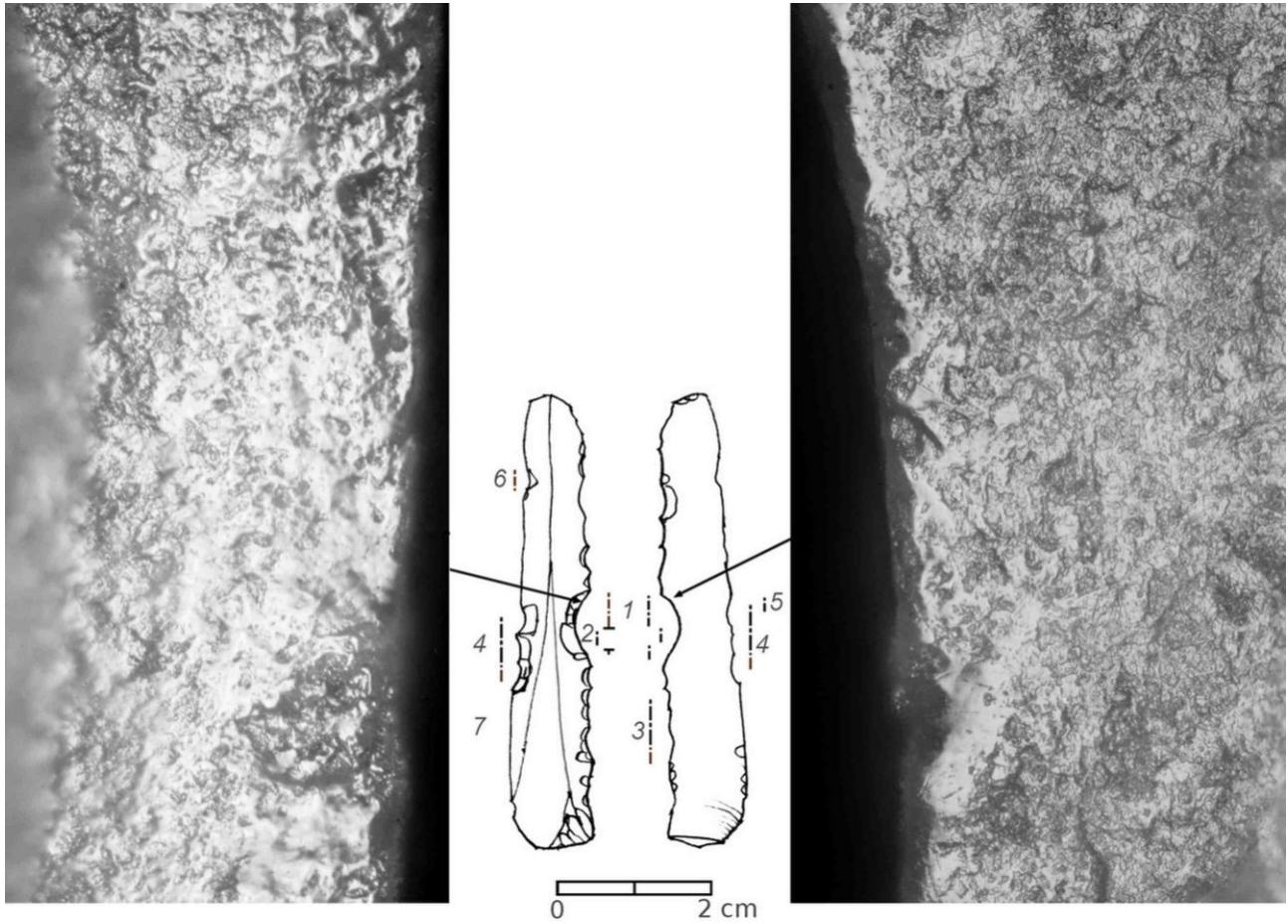


Figure 8: Notched blade from La Grange. Non-contact surface on the dorsal face, contact surface on ventral face.

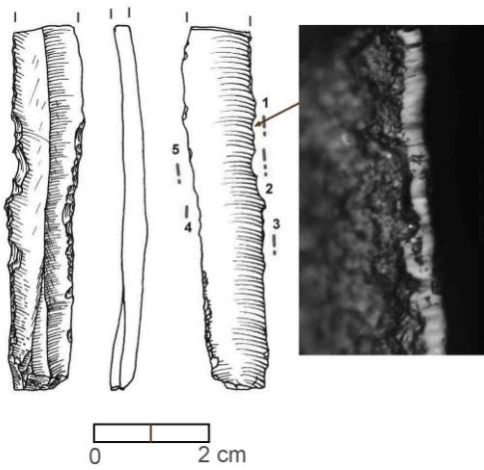


Figure 9: Notched blade from Noyen-sur-Seine. Bone polish on ventral face.

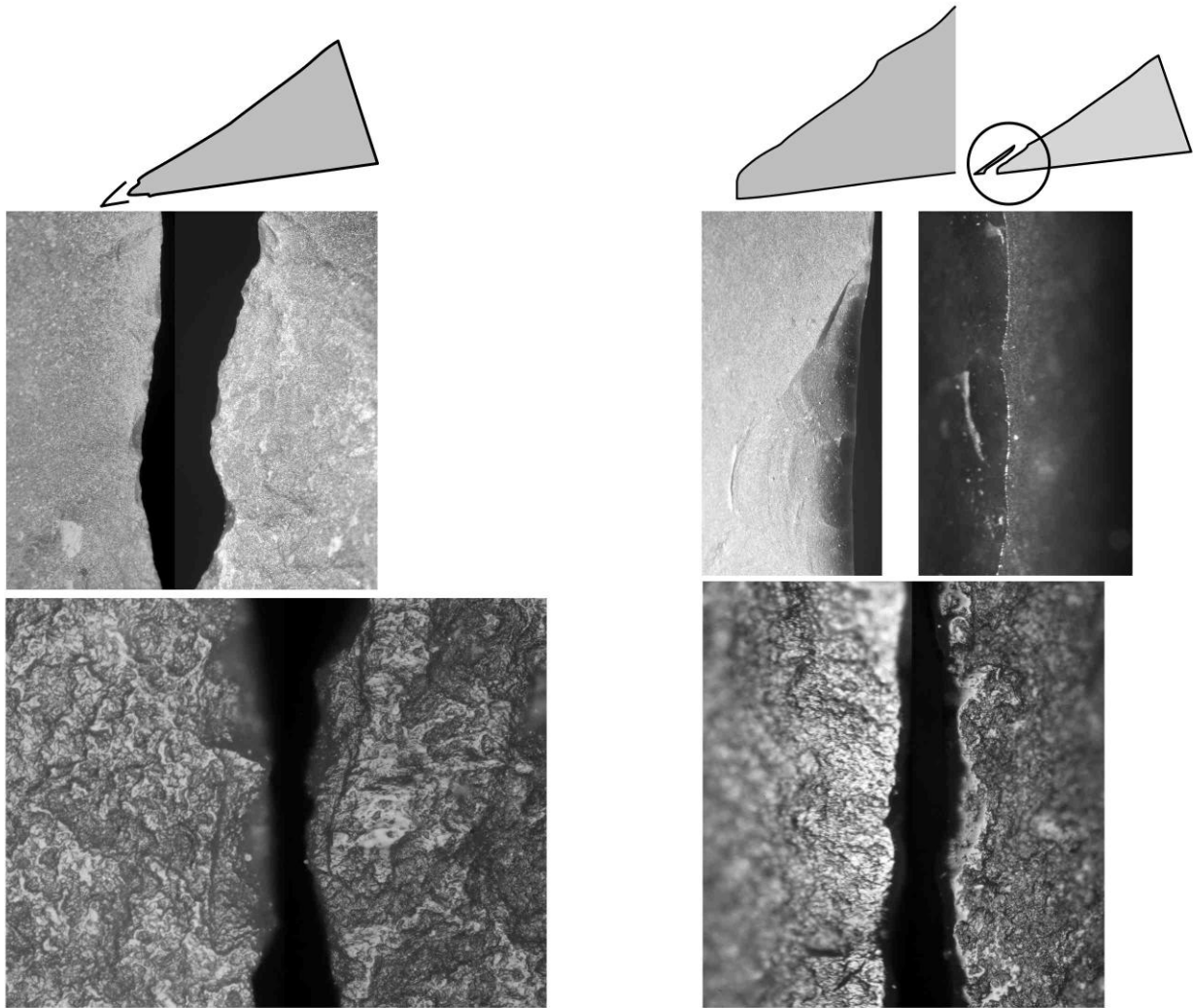


Figure10 : Experimental tools. Scraping dry soft wood (*Corylus Avelana*). Left: “coupe positive”. Symetric use-removals and polish on both faces. Right: “coupe negative”. Retouch removals from bending fracture; no use-scars, dissymmetric polish. Ventral face on the right.